WARM UP:

- Worksheet from 7.1 notes, #3 and 4

2)

STATE
1) SRS
2) norm. pop
or
n>30

$df = 19$

CHECK
1) circled
2) circled

$\bar{X} + t^*(s/\sqrt{n}) = (6.0463, 7.6937)$

We are 95% confident that the true average weight of babies born in Northside Hospital is between 6.0463 and 7.6937 lbs.

3)

STATE
1) SRS
2) norm. pop
or
n>30

$df = 23$

CHECK
1) assumed
2) stated

$\bar{X} + t^*(s/\sqrt{n}) = (15.21, 18.19)$

We are 99% confident that the true average is between 15.21 and 18.19 units.

4)

STATE

1) SRS
2) normal pop
   or
   n>30

CHECK

1) circled
2) circled

Ho: $\mu = 4.9$
Ha $\mu > 4.9$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = 0.8018$$

$P(t > 0.8018 \mid \underline{df = 21}) = 0.2158$

- We fail to reject Ho because p-value > alpha = 0.05.

- We have sufficient evidence that the true average carbon monoxide level is still 4.9 units.

5)

STATE	**CHECK**
1) SRS	1) assumed SRS
2) normal pop or n>30	2) assumed normal

Ho: $\mu = 32$
Ha: $\mu > 32$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = 1.20$$

$P(t > 1.20 \mid df = 15) = 0.1244$

- We fail to reject Ho because p-value > alpha = 0.05.

- We have sufficient evidence that the true average is still 32 units.

7.1 **Mean Difference/ Matched Pairs Design**

- How many samples? 2 samples – combine into 1
- What type of design? comparative
- Most common types of problems:
  - 1st/2nd group
  - before/after
    * always after – before
- Can also be…
  - 2 subjects matched together (twins, couples)
  * not good design – lurking vars.
- Two sets of data must be…
  dependent
- How do we compare the 2 sets of data?
  - look @ differences   avg. diff.

- Once we have the differences…
  - We use… one sample t procedures
  - Test… the mean (avg) difference μ_d
  - How do we write this in the hypotheses?

$H_0: \mu_d =$ ____

$H_a: \mu_d \gtrless \neq$ ____

often 0

$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$

$P(t$ $)$

- Conclusion:
  - same
  - We have suff. evid. that the avg. difference between ______ is ____ units.

- **Assumptions:**
  - SRS
  - normal pop. of differences
    or
    $n_d \geq 30$

Don't do in Ch.7: power of t-test

sign test for matched pairs

p. 517-523

Example #1:

The SAT prep course here at CB south claims to increase the SAT math scores of its students by 30 points. We don't think it is this much. We think it is less. We measure 5 students' SAT math scores before and after taking the class and find the following data. Test the hypotheses.

Subject	Before (L_1)	After (L_2)	After − Before
A	500	520	
B	430	440	
C	490	480	
D	550	590	
E	520	550	

$H_0: \mu_d = 30$

$H_a: \mu_d < 30$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = -1.395$$

State

1) SRS

2) norm pop. of diff or $n_d \geq 30$

Check

1) assumed

2) assumed normal

$P(t < -1.395 \mid df = 4) = 0.1177$

- We fail to reject....
- We have suff. evid. that the avg diff. in scores after SAT prep course is still 30 pts.

Example #2:

We want to test the differences between Mrs. Tannery's ~~(CB East teacher)~~ Block 2 and Block 4 SAT prep classes. Mrs. Tannery thinks that she taught Block 2 better than Block 4. Using the data below, test the hypotheses. The data gives the average class score for each of the 9 weeks of the course.

Date	Block 2 (L_1)	Block 4 (L_2)
10-Sep	480	472
17-Sep	497	495
24-Sep	505	502
1-Oct	499	524
8-Oct	517	515
15-Oct	524	530
22-Oct	552	531
29-Oct	540	531
5-Nov	583	574

$L_3 = L_2 - L_1$ = Block 4 − Block 2

$H_0: \mu_d = 0$

$H_a: \mu_d < 0$ $\qquad$ $\mu_d > 0$

$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = -0.605$ $\qquad$ 0.605

State

1) SRS

2) norm pop. of diff. or $n_d \geq 30$

Check

1) assumed

2) assumed norm pop.

$P(t < -0.605 \mid df = 8) = 0.2811$

- We fail to reject Ho b/c p-value $> \alpha = 0.05$.
- We have suff. evid. that the avg. diff. btw. Block 2 & 4 is equal to 0, thus Mrs. Tannery taught them the same.

Try problem #2 on the next page

(a) $A = L_1$

$B = L_2$

$L_3 = L_1 - L_2 = A - B$

$H_0: \mu_d = 0$

$H_a: \mu_d > 0$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = 2.8211$$

$P(t > 2.8211 \mid df = 7) = 0.013$

- We reject Ho b/c p-value < $\alpha = 0.05$

- We have suff. evid. that the true avg. difference btw. assessor A and B is greater than 0 (thousand $)

- thus assessor A does tend to give higher assessments than B.

~~**Answer to problem #2:**~~

(b) 95% conf. ($\alpha = 0.05$)

T-Interval

$L_3 = A - B$

$B - A$

$\bar{x} \pm t^* s/\sqrt{n} = (0.24, 2.73)$

We are 95% confident that the true average difference btw. assessors A and B is btw. 0.24 and 2.73 thousand dollars.

(c) SRS

norm. pop. of diff.

or

$n_d \geq 30$